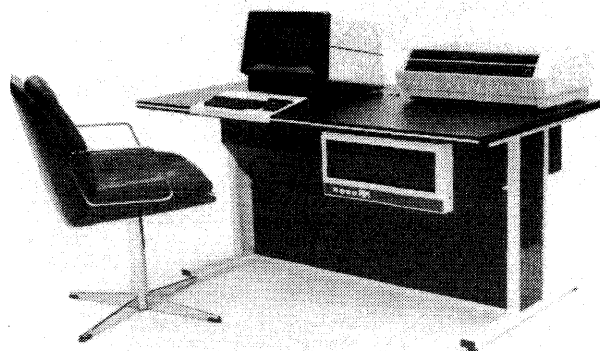# Mini-Computer Systems MICOS Family

The basic MICOS 75 is a packaged system consisting of a CPU with 64K bytes of main memory, 4-slot chassis, automatic program load, real time clock, one CRT terminal, 10-megabyte cartridge disk drive, 150 cps printer, and system software. The purchase price is $26,600.

MANAGEMENT SUMMARY

Mini-Computer Systems (MCS) installed its first system in March 1973 and has installed more than 1600 MICOS systems to date. The company's newest system, MICOS 75, was announced in September 1979. MICOS 75, a smaller lower-cost version of the very successful MICOS small business computer system, is available only as a packaged system with one or two CRT's.

MCS was founded in 1969 as a systems house with something extra. It purchases processors and peripherals from sources that can meet its specifications and develops its own CRT terminals, controllers, interfaces, and deskware. As is characteristic of a systems house, once the hardware is assembled, MCS adds its own operating system and the necessary applications software, and markets the system called MICOS.

Historically, most of the company's sales have been made on an OEM basis. The remaining sales have been through its world-wide branch offices to end users. MCS sells its systems either with operating system and related software, or on a full turnkey basis with packaged application programming. The company offers a discount to OEM's for purchase of hardware nad the MICOS operating system.

The original source of income for MCS was the sale of assembly-language application programs and Nova hardware systems, primarily with teletypewriter terminals. With a staff well versed in engineering, MCS developed a system called Packaged Applications for Civil Engineers ▷

MICOS 75, 100, 200, and 300 are business computer systems based on the Data General 3/12 and 3/4 processors. About 70 percent of the sales of these multi-user, multi-job systems are to OEM users who add application software to produce turnkey systems for end users. MCS also sells turnkey systems directly to large end users.

CHARACTERISTICS

MANUFACTURER: Mini-Computer Systems Inc., 399 Fairview Park Drive, Elmsford, New York 10523. Telephone (914) 592-8812.

Founded in October 1969, Mini-Computer Systems (MCS) began full-time operations in early 1970. The company went public in November 1972. Mini-Computer Systems occupies over 80,000 square feet of space and employs 285 technical personnel at its corporate headquarters in Elmsford, New York. In addition there are national sales offices located in Canada, France, the United Kingdom, and the United States. The company is a systems house actively engaged in the procurement of peripherals and processors and the development of software to produce integrated systems.

MODEL: MICOS 75, 100, 200, and 300.

DATE ANNOUNCED: February 1973—MICOS 200; July 1977—MICOS 100; October 1978—MICOS 300; September 1979—MICOS 75.

DATE OF FIRST DELIVERY: March 1973.

NUMBER INSTALLED TO DATE: Over 1600 MICOS installations as of October 1979.

DATA FORMATS

The MCS MICOS systems are based on the 16-bit Data General Nova 3/12 and 3/4 processors. However, the user does not normally work with the system at the machine level, but at the application program level. In some cases, users will develop or modify programs using the Extensive BASIC programming language used by MCS and its OEM users to write application programs. Assembly-language programming is used for the operating software, but its use by users is not encouraged. The information presented in the following paragraphs reflects the facilities of Extensive BASIC as available to MICOS users.

BASIC UNITS: Decimal digits and alphanumeric characters. Representations include simple arithmetic variables, one- or two-dimension numeric arrays, and character strings.

FIXED-POINT OPERANDS: Integer arithmetic is restricted to values of ± 32768; each value is stored in one 16-bit memory location.

FLOATING-POINT OPERANDS: An explicit dimensioning statement permits the user to identify a numeric value with a precision of 6 or 14 decimal digits; these values refer to the fraction part of a floating-point representation. Exponent values for the two representations are limited to ± 63. The two types occupy two or four words of memory, respectively. In practice, users will normally use conventional decimal representation and will be unaware of the internal floating- ▶

Mini-Computer Systems MICOS Family

(PACE). Since then, MCS has rapidly expanded its application base and its potential sources of customers. The policy of volume sales on an OEM basis has certainly helped this cause. The company's OEM customers, some of whom started out as end users, have developed applications which, with the assistance and encouragement of MCS, are now marketed with MCS hardware as turnkey systems.

MCS, as a matter of policy, is not bound to any manufacturer for hardware. However, Data General has consistently been called upon to supply the processor, which currently is a Nova 3/12 or 3/4 with 65K bytes of 800-nanosecond MOS memory, real-time clock, automatic program load, and auto restart.

In peripherals, MCS has used a variety of sources. Currently, the company is using disk drives from Control Data and Western Dynex; magnetic tape units from Pertec; printer from Centronics, Data Printer, and sometimes Printronix; card readers from Documation; video display terminals and controllers manufactured by MCS in its California facility; and deskware (computer furniture) manufactured by MCS in its New York facility. Other types of peripherals may be supported as users request them.

The operating systems currently in use by MCS are entitled Mini-Computer Operating System (MICOS), and MICOS 300. They are proprietary products developed exclusively for use on MCS systems. MICOS and MICOS 300 are multi-task and multi-user systems requiring 7K to 8K bytes for the executive and 12K to 14K bytes for the Data Management System. Extensive BASIC is the programming language currently supported. It is an MCS-enhanced version of the BASIC language as developed by Dartmouth College. The operating system packages also include a print spooling program, a disk sort, and a text editor.

USER RATINGS

Datapro was able to contact six MICOS system users from a list of about fourteen supplied by MCS. These users had a total of six systems installed, 2 each of the models 100, 200, and 300, for an average time of about 27 months. Three of the systems included 64K bytes of memory and three had 128K bytes. The number of on-line interactive terminals ranged from 1 to 8, and four of the systems were using remote batch terminals.

The following table summarizes the ratings given by these users.

	Excellent	Good	Fair	Poor	WA*
Ease of operation	5	1	0	0	3.8
Reliability of mainframe	4	2	0	0	3.7
Reliability of peripherals	2	4	0	0	3.3
Maintenance service:					
Responsiveness	2	3	1	0	3.2
Effectiveness	3	2	1	0	3.3
Technical support	3	2	1	0	3.3

point representation; however, explicit exponent values can be entered.

INSTRUCTIONS: The BASIC statements are of normal form, with a 1- to 4-digit statement (line) number followed by an English word or abbreviation and an expression or parameter list. Generally, the maximum statement size is limited to 2 display lines or 132 characters. The statements are stored in the system in an intermediate form, with spaces deleted and some decoding. The system BASIC interpreter accesses, decodes, and executes these statements directly in statement-number order, modified by any branching or looping directives in the program itself.

INTERNAL CODE: 7-bit ASCII; the eighth bit is fixed as "zero."

MAIN STORAGE

TYPE: MOS.

CYCLE TIME: 700 nanoseconds per 16-bit fetch.

CAPACITY: 65,536 bytes of main memory; add-on memory of up to 262,144 bytes for the Nova 3/12; 65,536 bytes of main memory for the 3/4.

CHECKING: None.

STORAGE PROTECTION: None.

RESERVED STORAGE: A buffer pool, consisting of 512-byte buffers for various I/O operations, is reserved. The binary and bootstrap loaders and core dump also require fixed storage in upper memory. In addition, resident portions of the operating system, including the BASIC interpreter, detract from the amount of memory available to the user for programs.

CENTRAL PROCESSOR

The central processors currently used in MCS systems are the Data General Nova 3/12 and the Nova 3/4, with realtime clocks. The processors ae detailed in Report M11-304-101. Because the user will seldom, if ever, become involved at the machine level, details of the processors are not repeated here.

INSTRUCTION TIMINGS: Information on BASIC statement execution times was not supplied by MCS. Machine-level instruction times for the Nova processors can be found in Report M11-304-101.

INTERRUPTS: A 16-level programmed priority interrupt facility is used to recognize interrupts for I/O operations. Each I/O device is wired to one of 16 bus positions and is either authorized or denied authorization to interrupt particular service routines by an Interrupt Disable Mask Bit that corresponds to the bus position of the device.

PHYSICAL SPECIFICATIONS: The MICOS 75 and 100 are housed in cabinets that are 30 inches high, 24 inches wide, and 32 inches deep. The weight of the processor and the cabinet is 150 pounds.

The MICOS 200 has the same dimensions as the MICOS 75 and 100, but weighs 230 pounds. (The expansion chassis weighs 130 pounds).

The MICOS 300 processor is housed in a cabinet which stands 30 inches high, 68 inches wide, and 32 inches deep. The cabinet and the CPU weight 430 pounds, together.

All processors require 117 volts at 60 Hz. Recommended operating environment is between 60 and 79 degrees F., and between 45 and 70 percent relative humidity. Power con-

Mini-Computer Systems MICOS Family

PERIPHERALS/TERMINALS

DEVICE	DESCRIPTION AND SPEED	MANUFACTURER
MAGNETIC TAPE EQUIPMENT		
	9-track, 800 bpi, NRZI, 10.5-inch reels, 45 ips; 36 KBS; IBM-compatible, controller for up to four drives	Pertec
	9-track, 1600 bpi, NRZI, 10.5-inch reels, 45 ips; 36 KBS; controller	Pertec
PRINTERS		
	Serial Matrix; 132 characters per line, 7 x 9 dot matrix, 64 ASCII character set, bidirectional; 60, 120, or 180 cps	
	Matrix Line Printer; 132 characters per line, 7 x 9 dot matrix, 64 ASCII character set, 6 or 8 characters per inch vertical spacing; 300 or 600 lpm	
	Letter quality printer; 55 cps	
PUNCHED CARD EQUIPMENT		
	Reader; 80-column, 500-card hopper/stacker; 300 cpm	
TERMINALS		
	CRT display/terminal; 1920 characters, 24 lines x 80 character per line, 64 ASCII character set, up to 19,200 baud	

▷

	Excellent	Good	Fair	Poor	WA*
Manufacturer's software:					
Operating system	4	1	0	0	3.8
Compilers & assemblers	1	1	0	0	3.5
Applications programs	2	3	0	0	3.4
Ease of programming	3	1	0	0	3.8
Ease of conversion	2	2	0	0	3.5
Overall satisfaction	2	4	0	0	3.3

*Weighted average on a scale of 4.0 for Excellent.

On the plus side, these users cited ease of use and programming, growth capability, and the MICOS operating system as system features that they were particularly impressed with. On the negative side, two users felt the system was slower than they would have liked, while one user commented that he had trouble communicating with MCS support personnel initially, but that this situation was improving.

Overall, these users were very pleased with the MICOS systems. It is easy to understand why MCS has installed more than 1600 systems in less than seven years. □

▶ sumption for the MICOS 75, 100, 200 and 300 is 600, 600, 820, and 1,640 watts, respectively.

INPUT/OUTPUT CONTROL

INPUT/OUTPUT CHANNELS: An I/O bus and a Direct Memory Access (DMA) channel are standard. Various high-speed options are available. The DMA data channel provides a multiplexer-like capability and can be seized by any device through a data channel request to handle 16-bit data transfers to and from main memory. The DMA channel can be used to increment the contents of storage locations by "1."

CONFIGURATION RULES: Up to 62 peripheral devices can be attached to a Nova I/O bus. The actual number of devices that can be attached to a particular Nova depends upon the available slots in the basic chassis and any available chassis extensions. The processor occupies one slot. Generally, magnetic tape drives, line printers, punched card readers, and disk drives require one slot each. The MICOS system can support up to eight disk volumes (4 drives).

MCS has their own arithmetic feature which is a 15-inch

by 15-inch printed circuit card and requires one slot in the central processor.

MASS STORAGE

CARTRIDGE DISK DRIVE: Provides 10-million bytes of data per drive. Up to four drives per controller, with only one controller per system. Capacity is achieved by one fixed spindle and one removable 5440 type cartridge of 5-million bytes each. Disk rotation is 2400 rpm; average access time is 38 milliseconds; transfer rate is 312,500 cps. Data is formatted as 512 characters per sector with 12 sectors per track.

CARTRIDGE MODULE DISK DRIVE: Provides 32- or 64-million bytes of data per drive when unformatted. Up to two cartridge module drives on one controller provide up to 108-million bytes of on line disk storage per system. Only one controller per system on a single printed circuit card. Transfer rate is 1,250,000 cps; disk rotation is 3600 rpm; average access time is 30 milliseconds. There are 32 sectors per track and 512 characters per sector. The 32/64 million byte drive is the CDC model 9448.

STORAGE MODULE DISK DRIVE: Provides 80-million bytes of data drive when unformatted. One controller per system on a single printed circuit card supports up to four drives to provide up to 268-million bytes of storage. Transfer rate is 1,250,000 cps; disk rotation is 3600 rpm; average access time is 30 milliseconds. There are 32 sectors per track and 512 characters per sector. This drive is manufactured by CDC (CDC-9762).

DISK PACK DRIVE: Provides 300 million bytes. With one controller per system, up to four storage module drives can provide over one billion bytes of on-line disk storage. The 300-million byte unit is the CDC model BJ4A2 and features twelve removable platter disk packs. Disk rotation is 3600 rpm; average access time is 1,250,000 cps; and transfer rate is 1,250,000 cps. Data formats are broken down for physical/logical locations; characters per sector are 512/2048, and sectors per track are 32/8, respectively. The 300-million byte unit is available only on the MICOS 300 system.

INPUT/OUTPUT UNITS

See Peripherals/Terminals table.

COMMUNICATIONS CONTROL

HIGH-SPEED COMMUNICATIONS CONTROLLER: Provides a full- or half-duplex interface for a single high-speed line operating at up to 50,000 bps. Six-, seven-, or eight- ▶

Mini-Computer Systems MICOS Family

► bit data characters are selectable through jumpers. Programmable features include automatic line synchronization and end of transmission recognition. A modem control is included in the subsystem. Options include parity checking with each character and an internal clock.

COMMUNICATIONS SOFTWARE: The MICOS and MICOS 300 Operating Systems support remote job entry (RJE) by emulating an IBM 2780.

MICOS Telecommunications Access Method (MTAM) provides support to allow an EXTENSIVE BASIC program to perform telecommunications between the MICOS system and a remote station using the ordinary file manipulation statements such as OPEN FILE, ACCEPT FILE, and PRINT FILE. MTAM employs binary synchronous (Bi-sync) communications techniques of the type which supports the IBM 2780. The remote station may be another MICOS system or any of a variety of computer terminals or computer systems. The synchronous MTAM requires a synchronous line adapter and the MTAM software option.

MTAM also supports the bisync protocol over a standard MICOS asynchronous multiplexer, allowing MICOS systems to be connected together or in a network using the less-expensive asynchronous modems, and without the need for the synchronous line adapter. However, since there is no industry standard for asynchronous communications, this version of MTAM only provides for telecommunications with other MICOS systems similarly equipped.

Typical MTAM applications include sales summary reporting, inventory management, and the use of the MICOS system as a satellite workstation to a larger central computer.

SOFTWARE

Software support for the MCS systems consists of a proprietary operating system developed by MCS and software application packages developed as needed and provided on a nonexclusive basis.

The general program design used by MCS is to employ the CRT screen to replace or supplement the documents currently in use by the customer, but in an automated environment.

OPERATING SYSTEM: The *Mini-Computer Operating System (MICOS and MICOS 300)* support one high-level language, Extensive BASIC, and a group of utilities which includes a general-purpose disk sort and a peripheral spooling package.

MICOS and MICOS 300 are disk-resident, multi-user, multi-tasking operating systems requiring 7K to 8K bytes for the resident supervisor. Among the services provided by the operating systems ae task scheduling, dynamic allocation of memory, overlay handling for non-resident system functions, interrupt handling, transient load facilities, and a data management system (DMS).

Multiple users can access the system simultaneously for independent tasks. Processor time is allocated on a cyclic basis among the competing tasks. If sufficient space exists in the user area (i.e., if the tasks are sufficiently small), two or more tasks can exist in main memory at one time. The governing factor for switching among tasks is I/O operations. On every I/O operation, the active task is suspended and the next task in the queue is activated if no incomplete I/O operations are outstanding against it. If the next task is not in memory and insufficient space is available for loading it, one or more tasks are swapped out to the swapping memory or reserved disk space. An INHIBIT command is available within a BASIC program that effectively locks in current programs until an ALLOW command is encoun-

tered. In the case of successive print commands, for example, the use of INHIBIT can save time caused by multiple swaps in quick succession.

The memory available for the common user programming area, user tables, and Extensive BASIC Interpreter Main segment is 36K to 42K bytes. Space for user tasks is allocated in multiples of 2048- or 512-byte blocks. Swapping memory, if available to the system, is allocated in multiples of 512 bytes to each terminal. For a system with 32K bytes of swapping memory and eight terminals, 8192 bytes are allocated to each terminal. At any specific time, each terminal on the system can represent one task.

Background tasks are supported for functions that do not require operator interaction to input new data, such as the preparation of a report from data extracted from a master file. These may be assigned lower priority and executed when no terminal tasks are outstanding. MCS refers to this facility as a background terminal. This background technique is the only way such a program could exist in a MICOS system due to the I/O-initiated switching.

The programmer can cause a record to be "locked" when a program accesses it to prevent updating errors if two or more users are working out of the same file. Besides the Lock File/Unlock File statements, several other statements cause an automatic lock of a file because of the nature of the action taken on the file. These include Slot File (create available disk location), Scratch File, Insert Index, Delete Index, and Search Index.

DMS features shared access to data files by many users; chained lists for creation of hierarchical files with a variable number of records per data set; unlimited logical record size; a data file security system; the capability to create, delete, and modify files from a terminal; job and user logging; and re-entrant coding enabling multiple users to access the same function concurrently. Non-restrictive logical record size is a technique that allows users to call all, part, or multiples of a physical record.

DMS normally resides just above the system monitor and requires 12K to 14K bytes of memory. Provisions are contained in DMS for all I/O facilities except terminals. (Extensive BASIC provides its own terminal I/O.) In the system, DMS operates as an asynchronous task and communicates with Extensive BASIC via a work queue and the Data File Control Blocks.

There are two basic file structures that can be maintained on disk; random and sequential. Both files may be of two types, one with fixed-length records, the other with variable-length records. In both types of random files, the basic data grouping is a block (disk sector) or 512 bytes. This is also the maximum record length. The first block of the file is the file header. In sequential files, records are maintained on disk in strict sequence, with only the end of file address for the file contained in the header. In random files, data records are recorded in the order entered; the address of the next available location is maintained in the header.

Sequential files are read and processed consecutively, record by record. Fixed-length random files can be accessed by relative record number. Fixed or variable-length random files can be accessed through one or more index files, which contain pairs of key values and their logical record addresses within the file.

The index file is composed of non-contiguous, 512-byte or 2048-byte blocks. Forward and backward pointers to other index blocks are contained in the index file header to provide access to an entire random file. The chain references can be used to establish hierarchical or nested record groupings. Index files are searched hierarchically to find a match and ►

Mini-Computer Systems MICOS Family

▶ retrieve the relative record address corresponding to the record desired. The use of multiple index files permits the random file to be accessed using different key groups.

The index file is normally transparent to the user insofar as information retrieval is concerned. It can, however, be used to store a small amount of data with the record key and be used directly, without reference to a random file.

Two additional applications of the indexed file structure and access are searches for records when only partial information is known and simplification of access to data in a particular, frequently used order. To support the first application, separate index files can be maintained, each based on an element of record identification. Parallel searches based on two or more elements can greatly reduce the number of records that have to be retrieved and viewed to obtain the desired record. The second application presupposes the need to produce a printed report or separate data file in several different sequences from data contained in one file; in this application, the indexing capability eliminates the need for a sort operation.

The accounting function of MICOS causes a file to be maintained that includes records for each operator using the system. Information recorded includes connect time, processor time, number of disk file accesses, maximum number of disk sectors allotted, and number of disk sectors currently being used.

A password technique is used to control access to particular programs and data files. Files and programs may be accessed by the program creator, by the program creator and the group to which he belongs as assigned by the group manager, or by everyone. Above the group manager is the systems manager. Each user has an identification number within the group as well.

LANGUAGE: Under MICOS and MICOS 300, one language is presently supported: *Extensive BASIC*. The language is device-independent and includes these features: about 20 console commands for system control; about 20 built-in functions; integer, standard precision, extended precision, and string data types; error-trapping facilities; alphanumberic string manipulation capability from 1 to 32,767 characters; program segmentation capability; facilities for matrix algebra including array manipulation and two-dimensional subscripting; access to the entire Data Management Ssytem, including shared sequential, random, and indexed files; ability to use a SPOOL package; the computed GO TO statement; and the ON ERROR statement to trap logical errors. Extensive BASIC requires a 28K-byte partition for the interpreter main segment, user status tables, and common user program area.

UTILITIES: Of particular merit are the SPOOL package, a disk sort, an editor for text, and a formatter for text.

The *Print Spooler* is a general-purpose package that allows multiple users to input data to be queued in a disk file for later printing. Jobs can be put into classes for printing, but the individual order of job printing within a class cannot be controlled.

The *MICOS Sort* is a generalized disk sorting routine for files that allows up to 10 different control fields up to 120 bytes long. Each of these fields may be sorted into either ascending or descending sequence.

The *APT* (Application Programming Tools) package consists of programs designed to assist users in the design, implementation, and documentation of a system. The three major components are: 1) program generators to supplement Extensive BASIC programming; 2) techniques to complement the
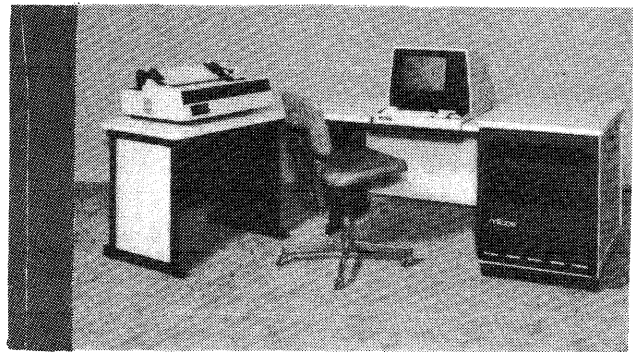
The MICOS 200 is based on the Data General Nova 3/12 CPU. A basic 200 includes 64K bytes of main memory, 12-slot chassis, automatic program load, and MICOS operating system. The purchase price is $20,700.

generators for customization; and 3) application programming standards.

The *MICOS report generator* compiles unique Extensive BASIC programs and catalogs them in an application system for output as multi-file reports in either columnar form or for printing on customized, preprinted forms.

APPLICATIONS SOFTWARE: MCS has developed many of its own turnkey applications, as well as supporting user-developed programs. Some of these programs are in package form and are available from MCS or its customers. The general industries in which MCS or its users have developed software programs are: apparel; apparel distribution; apparel importing; apparel manufacturing; clubs and organizations; construction; credit unions; distribution of stereo and related equipment; electric utilities; fuel oil dealers; food; hospitals; hardware, wholesale and retail; commerce, government, and industry (FACT MATCHER); computerized accounting package (MICAPS); management information (Wholesale Distributor System); industrial control equipment manufacturers; and insurance. Detailed information is available from local MCS representatives.

PRICING

POLICY: MCS systems are available for purchase. The systems are sold either to end users or on an OEM basis, with appropriate quantity discounts. The systems are also available on a turnkey basis, with the quoted price depending on the application software selected.

SUPPORT: Maintenance can be performed by MCS through field service centers, world-wide. In Canada, centers are located in Edmonton, Sarnia, St. Laurent, Toronto, and Winnipeg; in France, Paris; in the Netherlands, Amstelveen; in the United Kingdom, Bristol, Glasgow, Leedo, London, and Manchester; and in the United States, Anaheim, Atlanta, Boston, Charlotte, Chicago, Cincinnati, Dallas, and Elmsford. Outside their own territories, MCS and its representatives utilize subcontractors. MC's subcontracting arrangement is unique within the industry. MCS subcontracts through various independent representative and supplies parts and training. The subcontractor shares contract revenues 50/50 with MCS. A standard contract provides service during a prime shift of 9 a.m. to 5 p.m., Monday through Friday.

EQUIPMENT: The typical systems below include all controllers, cables, and terminators.

TYPICAL MICOS 75 SYSTEM: MICOS 75 CPU with 65,536 bytes of MOS memory; 10-megabyte cartridge disk drive; 150 cps matrix printer; CRT; cabinetry; and the MICOS operating system. Purchase price is $26,600. ▶

Mini-Computer Systems MICOS Family

► MICOS 100 SYSTEM: MICOS 100 CPU with 65,536 bytes of MOS memory; 64-megabytes of disk storage and controller; 300 lpm printer; CRT; and the MICOS operating system. Purchase price is $49,800.

MICOS 200 SYSTEM: MICOS 200 CPU with 65,536 bytes of MOS memory; 80-megabytes of disk storage and con-troller; 300 lpm printer; CRT; and the MICOS operating system. Purchase price is $61,000.

MICOS 300 SYSTEM: MICOS 300 CPU with 131,072 bytes of MOS memory; 300-megabytes of disk storage and controller; 600 lpm printer; CRT; and the MICOS operating system. Purchase price is $123,150. ■

EQUIPMENT PRICES

	Purchase Price	Monthly Maint.
PACKAGED SYSTEM		
MICOS 75 SYSTEM; Consists of a Nova 3/4 CPU with 64K bytes of main memory, a 4-slot chassis, automatic program load, real time clock, one CRT terminal, 10-megabyte cartridge disk drive, a 150 cps matrix printer, cabinetry, documentation, and the MICOS operating system	$26,600	$340
PROCESSORS		
MICOS 100; Includes a Nova 3/4 CPU with 64K bytes of main memory, 4 slot chassis, automatic program load, and the MICOS operating system	12,000	100
MICOS 200; Includes a Nova 3/12 CPU with 64K bytes of main memory, 12 slot chassis, automatic program load and the MICOS operating system	20,700	100
MICOS 300; Includes two Nova 3/12 processors: one with 64K bytes of main memory and 12 slot chassis, another with 128K bytes and 12 slots, an interprocessor adapter, MICOS arithmetic feature, and the MICOS 300 operating system	61,000	400
PROCESSOR OPTIONS		
MICOS Arithmetic Feature Board—Decimal	5,000	35
MICOS Arithmetic Feature Board—Binary	5,000	35
MICOS 100—MICOS 200 Upgrade	8,000	NA
MICOS 300 Deskware including system console terminal	5,600	30
Four channel multiplexor, no options	2,000	20
Four channel multiplexor, real time clock, printer controller, master I/O	3,500	25
Eight channel multiplexor, no options	4,000	30
Eight channel multiplexor, real time clock, printer controller, master I/O	5,500	35
MEMORY		
Extended memory controller module	4,200	30
Processor memory extensions (64K bytes)	5,400	50
MASS STORAGE		
Disk controller for 10 megabyte disk drive	4,500	30
Cartridge disk drive, 10 megabyte; up to four drives per controller; one controller per system on a single printed circuit card	8,000	95
Disk pack for 10 megabyte drive	250	NA
Disk controller for 32/64 megabyte disk drive	9,000	65
Cartridge module disk drive, 32 megabytes; up to two drives per controller; includes stand	12,000	110
Disk pack for 32 megabyte drive	500	NA
Cartridge module disk drive, 64 megabytes; up to two drives per controller; includes stand	17,000	140
Disk pack for 64 megabyte drive	500	NA
Storage module controller for 80 megabyte disk drive	12,000	85
Storage module disk drive, 80 megabytes; up to four drives per controller, includes stand	16,500	130
Disk pack for 80 megabyte drive	750	NA
Storage module controller for 300 megabyte disk drive	13,000	90
Storage module disk drive, 300 megabytes; up to four drives per controller; includes stand	32,000	225
Disk pack for 300 megabyte drive	1,650	NA

EQUIPMENT PRICES

	Purchase Price	Monthly Maint.

MAGNETIC TAPE EQUIPMENT

Magnetic tape controller for 800 bpi	3,500	25
800 bpi, NRZI tape drive with controller for up to four drives, 45 ips	8,600	70
Magnetic tape controller for 1600 bpi	5,400	40
1600 bpi, NRZI tape drive with controller, 45 ips	RFQ	RFQ

PRINTERS

Serial matrix printer with controller; 132 positions, with 7 x 9 dot matrix, 60 cps	2,200	25
7 x 7 dot matrix, 120 cps	3,200	35
9 x 9 dot matrix, 150 cps	3,500	65
7 x 9 dot matrix, 180 cps	5,200	55
Matrix line printer with controller; 132 positions, 64 character set, 8-channel VFU—		
7 x 9 dot matrix, 300 lpm	9,400	85
7 x 9 dot matrix, 600 lpm	14,750	RFQ
Letter quality printer, 55 cps	7,950	45

CARD EQUIPMENT

Card reader, 300 cards per minute, and controller; features 500 card hopper/stacker capacity, optical mark and/or punched cards	RFQ	RFQ
600 cpm	RFQ	RFQ
1000 cpm	RFQ	RFQ

TERMINALS

Video display terminal; 1920 characters, 80 characters per line by 24 lines, 64 ASCII characters, transmission speeds up to 19,200 baud	2,400	30

COMMUNICATIONS EQUIPMENT

High speed communications controller for one (1) full duplex or half duplex synchronous data set (Bell 201 or equivalent) for use with the MICOS MTAM Facility	3,000	25
Acoustic coupler, up to 300 baud, originate only	600	5
Acoustic coupler, up to 300 baud, original/answer	750	10
Modem, up to 1200 baud, originate/answer, leased or dialup single line	1,750	30
Modem, up to 1200 baud, originate/answer, leased or dialup single line, expandable up to 8 lines	2,700	30
Each additional line	1,350	NA
MICOS asynchronous communications controller, 8 channel	7,500	60

SOFTWARE

APT—Application Programming Tools	1,000	500
MICAPS—Payroll	4,000	500
MICAPS—Accounts Payable	3,000	250
MICAPS—Accounts Receivable	3,000	250
MICAPS—General Ledger	4,000	250
Wholesale Distributor System	15,000	500

Mini-Computer Systems MICOS and MICOS II

New Product Announcement

A new low-end minicomputer system, the MICOS 75, was announced in September 1979 by Mini-Computer Systems, Inc. The MICOS 75 will be marketed through authorized MICOS Distributors as an entry level business system for the first-time user. It can also be used as a remote data entry and storage device communicating with another MICOS system or a host mainframe.

The basic configuration includes a central processor with 64K bytes of MOS memory, a MIDAS display terminal, 10 megabytes of cartridge disk (5M fixed, 5M removable), a 150 cps matrix printer, a desk, and the MICOS operating system. This configuration carries a purchase price of $26,600.

Options available for the MICOS 75 include a second CRT, a 180 cps or 300 lpm matrix printer, and MTM, a synchronous communications package using 2780 communications protocol. The MICOS 75 is software compatible with other members of the MICOS family, facilitating upgrades.

Delivery of the MICOS 75 systems will begin in November 1979.